

AMENDMENTS TO THE CLAIMS

A detailed listing of all claims that are, or were, in the present application, irrespective of whether the claim(s) remains under examination in the application are presented below. The claims are presented in ascending order and each includes one status identifier. Those claims not cancelled or withdrawn but amended by the current amendment utilize the following notations for amendment: 1. deleted matter is shown by strikethrough; and 2. added matter is shown by underlining.

Claims

1. (Original) A catalyst for use in a Fischer-Tropsch synthesis reaction which comprises cobalt supported on alumina, in which: the catalyst average particle size is in the range 20 to 100 μm ; the specific surface area of the impregnated and calcined catalyst particles is greater than 80 m^2/g ; the average pore size of the impregnated and calcined catalyst is at least 90Å (9nm); and the pore volume of the impregnated and calcined catalyst is greater than 0.35 cm^3/g .
2. (Original) A catalyst as claimed in Claim 1, in which the specific surface area of the catalyst particles is in the range 120 to 220 m^2/g .
3. (Original) A catalyst as claimed in Claim 1, in which the particle size range is 40 to 80 μm .
4. (Currently Amended) A catalyst as claimed in ~~any preceding Claim 1~~, in which the average pore size of the catalyst is at least 110Å (11nm).

5. (Original) A catalyst as claimed in Claim 4, in which the average pore size is at least 130Å (13 nm).
6. (Currently Amended) A catalyst as claimed in Claim 1 in which the specific surface area of the impregnated and calcined catalyst is ~~less than~~ at least 120 m²/g and the average pore size is at least 130Å (13nm).
7. (Currently Amended) A catalyst as claimed in ~~any preceding Claim 1~~, in which the pore volume of the catalyst is at least 0.45 cm³/g.
8. (Currently Amended) A catalyst as claimed in ~~any preceding Claim 1~~, incorporating less than 3% by weight of a promoter.
9. (Original) A catalyst as claimed in Claim 8, in which the promoter is rhenium or platinum.
10. (Currently Amended) A catalyst as claimed in ~~any preceding Claim 1~~, in which the support material is γ -alumina .
11. (Original) A catalyst as claimed in Claim 10, in which the γ -alumina is stabilised with a stabilising agent.
12. (Original) A catalyst as claimed in Claim 11, in which the γ -alumina is stabilised with lanthanum.

13. (Currently Amended) A catalyst as claimed in ~~any preceding Claim 1~~, in which the alumina support includes a binder.

14. (Original) A catalyst as claimed in Claim 13, in which the binder represents less than 25% by weight of the catalyst.

15. (Currently Amended) A catalyst as claimed in Claim 13 ~~or Claim 14~~, in which the binder is an alumina-containing binder material.

16. (Currently Amended) A catalyst as claimed in ~~any preceding Claim 1~~, in which the specific surface area of the prepared catalyst, comprising the cobalt in an active catalytic form on the support, is in the range 125 to 160 m²/g.

17. (Currently Amended) A catalyst as claimed in ~~any preceding Claim 1~~, in which the cobalt content of the catalyst is from 10 to 40% by weight.

18. (Original) A catalyst as claimed in Claim 17, in which the cobalt content is from 15 to 25% by weight.

19. (Original) A process for the production of a catalyst as claimed in any preceding Claim, which comprises: impregnating an alumina support with cobalt and optionally a promoter, optionally drying at less than 120°C, calcining the impregnated support at a temperature in the range 300 to 500°C and treating the calcined catalyst with a reducing gas at an activation temperature in the range 250 to 500°C; the alumina support prior to impregnation having a specific surface area in the range 80 to 225 m²/g and a pore diameter in the range 110 to 400Å (11 to 40nm).

20. (Original) A process as claimed in Claim 19, in which the alumina support has a pore volume in the range 0.6 to 1.0 cm³/g, prior to impregnation.
21. (Currently Amended) A process as claimed in Claim 19 ~~or Claim 20~~, in which the peak calcination temperature is in the range 300 to 450°C.
22. (Currently Amended) A process as claimed in ~~any of Claims 19 to 21~~ Claim 19, in which the activation temperature is in the range 300 to 500°C.
23. (Original) A process as claimed in Claim 22, in which the activation temperature is in the range 300 to 450°C.
24. (Currently Amended) A process as claimed in ~~any of Claims 19 to 23~~ Claim 19, in which the calcination is carried out for between 0.5 and 6 hours.
25. (Currently Amended) A process as claimed in ~~any of Claims 19 to 24~~ Claim 19, in which the activation treatment is carried out for between 1 and 10 hours.
26. (Currently Amended) A process as claimed in ~~any of Claims 19 to 25~~ Claim 19, in which the reducing gas is hydrogen and/or carbon monoxide, optionally mixed with an inert gas.
27. (Currently Amended) A process as claimed in ~~any of Claims 19 to 26~~ Claim 19, in which, prior to impregnation, the support is pre-calcined at a temperature in the range of 400 to 900°C.

28. (Currently Amended) A process as claimed in ~~any of Claims 19 to 27~~Claim 19, in which the alumina support is γ -alumina and the process includes the step of stabilising the γ -alumina prior to the calcination step.

29. (Currently Amended) A process as claimed in ~~any of Claims 19 to 28~~Claim 19, in which prior to impregnation, the alumina support has a specific surface in the range 150 to 240 m²/g.

30. (Currently Amended) A process as claimed in ~~any of Claims 19 to 29~~Claim 19, in which, prior to impregnation, the alumina support has a pore volume in the range 0.7 to 0.9 cm³/g.

31. (Currently Amended) A process as claimed in ~~any of Claims 19 to 30~~Claim 19, in which the impregnation step comprises an incipient wetness treatment in which an aqueous solution of a cobalt compound and optionally a rhenium compound is mixed with the dry support material until the pores are filled, and the impregnated support is then dried, prior to the calcining step.

32. (Original) A process as claimed in Claim 31, in which the amount of aqueous solution used in the impregnation is 0.05-2 times larger than the measured pore volume of the catalyst support.

33. (Currently Amended) A process as claimed in Claim 31 ~~or Claim 32~~, in which drying is carried out at 80 to 120°C.

34. (Currently Amended) A process as claimed in ~~any of Claims 31 to 33~~Claim 31, in which the cobalt compound is selected from cobalt nitrate ($\text{Co}(\text{NO}_3)_2$), cobalt acetate(s), cobalt halide(s), cobalt carbonyl(s), cobalt oxalate(s), cobalt phosphate(s), cobalt carbonate(s), cobalt (hexa)amine salt(s) and organic cobalt compounds.

35. (Currently Amended) A process as claimed in ~~any of Claims 31 to 34~~Claim 31, in which the rhenium compound is selected from perrhenic acid (HReO_4), ammonium perrhenate, rhenium halide(s) and rhenium carbonyl(s).

36. (Original) A process as claimed in Claim 35, in which the cobalt compound is cobalt nitrate and the rhenium compound is perrhenic acid.

37. (Currently Amended) A process as claimed in ~~any of Claims 19 to 25~~Claim 19, in which, prior to impregnation, the alumina support has an ASTM attrition value of less than 30% by weight of fines produced by 5 hours testing.

38. (Original) A process as claimed in Claim 37 in which the ASTM value is less than 20%.

39. (Currently Amended) The use of a catalyst as claimed in ~~any of Claims 1 to 18~~Claim 1, in a Fischer-Tropsch synthesis reaction.

40. (Currently Amended) The use of a catalyst manufactured according to a process as claimed in ~~any of Claims 19 to 38~~Claim 19, in a Fischer-Tropsch synthesis reaction.

41. (Currently Amended) The use of a catalyst as claimed in Claim 39 ~~or Claim 40~~, in which the reaction is carried out in a slurry bubble column reactor.

42. (Original) A use as claimed in Claim 41, in which H₂ and CO are supplied to a slurry in the reactor, the slurry comprising the catalyst in suspension in a liquid including the reaction products of the H₂ and CO, the catalyst being maintained in suspension in the slurry at least partly by the motion of the gas supplied to the slurry.

43. (Currently Amended) A process for the production of hydrocarbons which comprise subjecting H₂ and CO gases to a Fischer-Tropsch synthesis reaction in a reactor in the presence of a catalyst as claimed in ~~any of Claims 1 to 18~~ Claim 1.

44. (Currently Amended) A process for the production of hydrocarbons which comprise subjecting H₂ and CO gases to a Fischer-Tropsch synthesis reaction in the presence of a catalyst manufactured according to a process as claimed in ~~any of Claims 19 to 38~~ Claim 19.

45. (Currently Amended) A process as claimed in Claim 43 ~~or Claim 44~~, in which the reaction is a three-phase reaction in which the reactants are gaseous, the product is at least partially liquid and the catalyst is solid.

46. (Original) A process as claimed in Claim 45, in which the reaction is carried out in a slurry bubble column reactor.

47. (Original) A process as claimed in Claim 46, in which the H₂ and CO are supplied to a slurry in the reactor, the slurry comprising the catalyst in suspension in a liquid including the reaction products of the H₂ and CO, the catalyst being maintained in suspension in the slurry at least partly by the motion of the gas supplied to the slurry.

48. (Currently Amended) A process as claimed in ~~any of Claims 43 to 47~~Claim 43, in which the reaction temperature is in the range 190-250°C.

49. (Original) A process as claimed in Claim 48, in which the reaction temperature is in the range 200-230°C.

50. (Currently Amended) A process as claimed in ~~any of Claims 43 to 49~~Claim 43, in which the reaction pressure is in the range 10-60 bar.

51. (Original) A process as claimed in Claim 50, in which the reaction pressure is in the range 15 to 30 bar.

52. (Currently Amended) A process as claimed in ~~any of Claims 43 to 51~~Claim 43, in which the H₂/CO ratio of the gases supplied to the Fischer-Tropsh synthesis reactor is in the range 1.1 to 2.2.

53. (Original) A process as claimed in Claim 52, in which the H₂/CO ratio is in the range 1.5 to 1.95.

54. (Currently Amended) A process as claimed in ~~any of Claims 43 to 53~~Claim 43, in which the superficial gas velocity in the reactor is in the range 5 to 60 cm/s.

55. (Original) A process as claimed in Claim 54 in which the superficial gas velocity is in the range 20 to 40 cm/s.

56. (Currently Amended) A process as claimed in ~~any of Claims 43 to 55~~Claim 43, in which the product of the Fischer-Tropsch synthesis reaction is subsequently subjected to post-processing.

57. (Original) A process as claimed in Claim 56 in which the post-processing is selected from de-waxing, hydro-isomerisation, hydro-cracking and combinations of these.

58. (Original) A catalyst support in which the catalyst average particle size is in the range 20 to 100 μm and the average pore size of the catalyst is at least 90 \AA (9nm).

59. (Original) A catalyst support as claimed in Claim 58, having a pore volume greater than 0.6 cm^3/g .

60. (Currently Amended) A catalyst ~~Catalyst~~-support as claimed in Claim 58 ~~or Claim 59~~, having a specific surface area greater than 100 m^2/g .

61. (Currently Amended) A catalyst ~~Catalyst~~-support as claimed in ~~any of Claims 58 to 60~~Claim 58, in which the support material is silica, titanium dioxide or alumina.

62. (Currently Amended) A catalyst ~~Catalyst~~-support as claimed in Claim 58, in which the support material is alumina.

63. (Currently Amended) A catalyst ~~Catalyst~~-support as claimed in ~~any of Claims 58 to 62~~Claim 58, having an ASTM attrition value of less than 20.